Electropneumatic Positioner

Type 3730-2 and
Type 3730-3 with HART communication

Application
Single-acting or double-acting positioner for attachment to pneumatic control valves. Self-adjusting, automatic adaptation to valve and actuator.

Reference variable 4 to 20 mA
Rated travels 3.6 to 200 mm
Opening angle 24 to 100°

The positioner ensures a preset assignment of the valve stem position (controlled variable) and the electric input signal (reference variable). It compares the control signal received from a controller to the travel or rotational angle of the control valve and issues a pneumatic signal pressure as output variable.

Special features
- Simple attachment to common linear and rotary actuators over SAMSON direct attachment interface (Fig. 1), over NAMUR rib (Fig. 2) or to control valves with rod-type yokes according to IEC 60534-6-1 or to rotary actuators according to VDI/VDE 3845 (Fig. 3)
- Any desired mounting position
- Simple one-knob, menu-driven operation
- LCD easy to read in any mounting position due to selectable reading direction
- Ex d connection using Type 3770 Field Barrier (T 8379 EN)
- Configurable with a PC via the SSP serial interface using the TROVIS-VIEW software
- Variable, automatic start-up with four different initialization modes
- Preset parameters - only values deviating from the standard need to be adjusted
- Calibrated travel sensor without gears susceptible to wear
- Using the initialization mode "Sub" (Substitution), the positioner can be started up in case of emergency whilst the plant is running without the valve moving through the whole travel range
- Permanent storage of all parameters in non-volatile EEPROM (protection against power failure)
- Two-wire system with a small electrical load between 300 and 410 Ω depending on the version (see Table 1)
- Adjustable output pressure limitation
- Adjustable tight-closing function
- Constant monitoring of zero point
- Temperature sensor and operating hours counter integrated
- Two configurable position alarms as standard
- Self diagnostics; alarm messages indicated by fault alarm contact or optional analog position transmitter
- Extended diagnostics in Expert version, detailed documentation available in Data Sheet T 8388 EN.

Versions
Electropneumatic positioners with LCD, operable on site, local communication with SSP interface, EXPERT diagnostics
- Type 3730-2 Expert - Positioner with diagnostic functions
- Type 3730-2 Expert* - Positioner with extended diagnostic functions
- Type 3730-3 Expert - Positioner with additional communication with HART protocol, diagnostic functions
- Type 3730-3 Expert* - Positioner with additional communication with HART protocol, extended diagnostic functions

Associated Information Sheet T 8350 EN Edition November 2004
Data Sheet T 8384-2/3 EN
**Additional equipment (optional)**
- Inductive limit switch with proximity switch
- Analog position transmitter with two-wire transmitter
- Forced fail-safe venting function with solenoid valve
- External position sensor (Fig. 4)

**Principle of operation**
The electropneumatic positioner is attached to pneumatic control valves. It is used to assign the valve stem position (reference variable \( x \)) to the input signal (reference variable \( w \)). The input signal received from a control system is compared to the travel or rotational angle of the control valve, and a pneumatic signal pressure (output variable \( y \)) is produced.

The positioner consists of an electric travel sensor system (2), an analog i/p converter with a downstream booster and the electronics unit with microcontroller (5).

When a deviation occurs, the actuator is pressurized or vented. If required, the changes in the signal pressure can be slowed down by a connectable Q restriction. The signal pressure to the actuator can be limited by software to 1.4, 2.4 or 3.7 bar.

A constant air stream to the atmosphere is created by the flow regulator (9) with a fixed set point. The air stream is used to purge the inside of the case as well as to optimize the air capacity booster. The i/p module (6) is supplied with a constant upstream pressure by the pressure regulator (8) to make it independent of the supply air pressure.

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**Operation**
The positioner is operated with a user-friendly rotary pushbutton. The parameters are selected by turning the knob, pushing it activates the required setting. In the menu, all parameters are listed in one level, meaning there is no need to search in submenus. All parameters can be checked and changed on site.

All values are displayed on the LCD. The reading direction of the LCD can be rotated by 180° at the push of a button.

The closing direction of the control valve is indicated to the positioner by the DIP switch "Air to open/Air to close." It assigns the CLOSED position of the control valve to the position indicator "0 %.

The INIT key activates initialization which is started according to the (pre)set parameters. After initialization is completed, the positioner immediately starts control operation.

The SAMSON configuration software, TROVIS-VIEW, can be used to configure the positioner. For this purpose, the positioner is equipped with an additional digital interface to be connected to the RS-232 interface of a PC.

The Type 3730-3 Positioner additionally allows access to all parameters over HART communication.

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**Legend**
1. Control valve
2. Travel sensor
3. Controller
4. AD converter
5. Microcontroller
6. i/p module
7. Pneumatic booster
8. Pressure regulator
9. Flow regulator
10. Q restriction
11. Inductive limit switch (optional)
12. Solenoid valve (optional)
13. Position transmitter (optional)
14. Software limit switches
15. Fault alarm output
16. LCD
17. HART connection
(Type 3730-3 only)
### Table 1  Technical data for Type 3730 Positioner

<table>
<thead>
<tr>
<th>Common data for Type 3730 Positioner</th>
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<td><strong>Rated travel, adjustable</strong></td>
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<td><strong>Travel range, adjustable</strong></td>
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<td><strong>Reference variable w</strong></td>
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<td><strong>Minimum current</strong></td>
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<td><strong>Supply air</strong></td>
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<td><strong>Signal pressure (output)</strong></td>
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<td><strong>Characteristics</strong></td>
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<td><strong>Sensitivity</strong></td>
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<td><strong>Transit time</strong></td>
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<td><strong>Direction of action</strong></td>
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<td><strong>Air consumption, steady-state</strong></td>
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<td><strong>Air output capacity</strong></td>
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<td><strong>Permissible ambient temperature</strong></td>
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<td><strong>Influences</strong></td>
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<td><strong>Electromagnetic compatibility</strong></td>
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<td><strong>Degree of protection</strong></td>
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</table>

**Binary contacts**

- 1 fault alarm contact
- 2 software limit switches with configurable limit values, with reverse polarity protection
- 2-wire device with reverse polarity protection

**Signal status**

- Version Without explosion protection
- No response Conductive (R = 348 Ω) ≥ 2.1 mA
- Response Non-conducting ≤ 1.2 mA

**Operating voltage**

- For connection to binary input of the PLC acc. to EN 61131, Pmax = 400 mW
- For connection to NAMUR switching amplifier acc. to EN 60 947-5-6

**Materials**

- Housing Die-cast aluminum GD AlSi12 acc. to DIN 1725 (3.2582) · Chromated and powder paint coated
- External parts Stainless steel 1.4571 and 1.4301
- Cable gland M20 x 1.5, black polyamide
- Weight Approx. 1.0 kg

**Additional data for Type 3730-2**

- Load impedance Without explosion protection: ≤ 6 V (corresponding to 300 Ω at 20 mA)
- Explosion-protected version: ≤ 7 V (corresponding to 350 Ω at 20 mA)
- Communication (local) SAMSON SSP interface and Serial interface adapter
Software requirements (SSP)  | TROVIS-VIEW with database module 3730-2
---|---
Explosion protection  | Type of protection \( \oplus \) II 2 G EEx ia IIC T6 and \( \oplus \) II 2 D IP 65 T 80 °C or \( \oplus \) II 3 G EEx nA II T6

**Additional data for Type 3730-3**

| Load impedance | \( \leq 8.2 \text{ V} \) (corresponding to 410 \( \Omega \) at 20 mA)
| Communication (local) | SAMSON SSP interface and serial interface adapter
| Software requirements (SSP) | TROVIS-VIEW with database module 3730-3
| Communication (HART) | HART® field communication protocol
| Impedance in HART frequency range: Receiving 350 to 450 \( \Omega \) - Sending approx. 115 \( \Omega \)
| Software requirements (HART) | For hand-held communicator: Device Description for Type 3730-3
| For PC: DTM file according to specification 1.2, suitable for integrating the positioner in frame applications that support the FDT/DTM concept (e.g. PACTware); other integrations (e.g. AMS, PDM) are available
| Explosive protection | Type of protection \( \oplus \) II 2 G EEx ia IIC T6 and \( \oplus \) II 2 D IP 65 T 80 °C or \( \oplus \) II 3 G EEx nA II T6

**Table 1a  Options for Type 3730-2 and Type 3730-3 Positioners**

**Solenoid valve**  | SIL 4 approval acc. to IEC 61508
---|---
Input  | 24 V DC - Reverse polarity protection - Static destruction limit 40 V
Current consumption \( I = \frac{U}{R} = \frac{5.6 \text{ V}}{4020 \Omega} = 1.4 \text{ mA} \) (corresponding to 4.5 mA at 24 V)
Signal “0” no pick-up  | \( \leq 15 \text{ V} \)
Signal “1” safe pick-up  | \( > 19 \text{ V} \)
Service life  | \( > 2 \times 10^7 \) switching cycles
Implementation in safety-relevant systems in compliance with IEC 61508  | Probability of failure on demand of safety functions
PFD < 2.8 \times 10^{-7} for a confidence level of 95 %
The safe failure fraction (SFF) according to Table A1 in IEC 61508-2 is greater or equal to 0.99.
The valves are therefore suitable for implementation in safety-related systems with a hardware fault tolerance of 1 or 2 up to and including SIL 4.

**Analog position transmitter**  | Two-wire transmitter
---|---
Auxiliary power  | 12 to 30 V DC - Reverse polarity protection - Static destruction limit 40 V
Output signal  | 4 to 20 mA
Direction of action  | Reversible
Operating range  | \(-10 \text{ to } +114 \%\)
Characteristic  | Linear
Hysteresis  | Same as positioner
High-frequency influence  | Same as positioner
Ripple content of the output signal  | 0.6 \% at 28 Hz/IEC 381 T1
Other influences  | Same as positioner
Fault message  | Issued by means of a status current \( < 3.8 \text{ mA} \) or \( > 20.5 \text{ mA} \)

**Inductive limit switch**  | Type SJ 2SN Proximity switch
---|---
For connection to isolating switch amplifier acc. to EN 60 947-5-6.
Can be used in combination with a software limit switch.

**External position sensor**  | Same as Type 3730 Positioner
---|---
Rated travel  | Same as Type 3730 Positioner
Cable  | Max. 10 m - Flexible and durable - With M12x1 connector - Flame-retardant acc. VDE 0472 - Resistant to oils, lubricants, and coolants as well as other aggressive media
Permissible ambient temperature  | \(-40 \text{ to } +105 \text{ °C}\)
Immunity to vibration  | Up to 10 g in the range of 5 to 2000 Hz
Degree of protection  | IP 67
The Type 3730 Electropneumatic Positioner can be attached directly to the Type 3277 Actuator with a connection block. In actuators with fail-safe action “Actuator stem extends” and Type 3277-5 Actuator (120 cm²), the signal pressure is transmitted over an internal bore in the actuator yoke to the actuator. In actuators with fail-safe action “Actuator stem retracts” and in actuators with effective diaphragm areas of 240 cm² or larger, the signal pressure is transmitted to the actuator over a ready-made external piping.

Using the appropriate bracket, the positioner can also be attached according to IEC 60534-6-1 (NAMUR recommendation). The positioner can be mounted on any side of the control valve. A pair of universal brackets is used for the attachment to Type 3278 Rotary Actuators or other rotary actuators according to VDI/VDE 3845. The rotary motion of the actuator is transferred over a coupling wheel to the positioner.

The test certificates are included in the mounting and operating instructions and are available on request. Refer to Data Sheet T 8379 EN for EEx d certificates for the Type 3770 Field Barrier.
Dimensions in mm

Direct attachment

NAMUR attachment

Attachment to rotary actuators

Pressure gauge bracket or connecting plate

G ¼ or ½ NPT

Lever
S = 17 mm
M = 50 mm
L = 100 mm
XL = 200 mm

Connecting plate
G ¼ or ½ NPT

Connecting plate
Ordering text
Type 3730-... Positioner
- Without pneumatic connection (only for direct attachment to Type 3277 Actuator)
- With pneumatic connection ISO 228/1-G ¼
- With pneumatic connection ¼-18 NPT
- Without/with pressure gauge for signal pressure indication
- Additional cover plate with list of parameters and operating instructions in English/Spanish or English/French (standard version in German/English)
- Attachment to Type 3277 Actuator (120 to 700 cm²)
- Attachment according to IEC 60 534-6-1 (NAMUR)
  Travel: ... mm, if applicable, stem diameter: ... mm
- Attachment to Type 3278 Rotary Actuator (160/320 cm²)
- Attachment to rotary actuators acc. to VDI/VDE 3845
- Pneumatic reversing amplifier for double-acting actuators with connection interface acc. to ISO 228/1 - G ¼ or ¼-18 NPT
- Adapter M20 x 1.5 to ½ NPT
- Metal cable gland
- Special version with CrNiMo steel housing

Model and order numbers

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Specifications subject to change without notice.